

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Michalakakis Averkiou et al.
Art Unit:
Serial No.: to be assigned
Examiner:
Filed : herewith
For : ULTRASONIC DIAGNOSTIC IMAGING WITH
CONTRAST AGENTS

Hon. Commissioner of Patents
and Trademarks
Washington, D.C. 20231

INFORMATION DISCLOSURE STATEMENT

Dear Sir:

The attention of the Examiner is directed to the following items, copies of which are enclosed.

1. U.S. Pat. 4,572,203 (Feinstein) in the middle of column 5 describes the use of a contrast agent to indicate the areas of tissue which are not being adequately perfused.

2. U.S. Pats. 4,718,433 (Feinstein) and 4,774,958 (Feinstein) describe specific protein solution microbubble contrast agents.

3. U.S. Pat. 5,040,537 (Katakura) provides a shock wave generator to fracture encapsulated microbubble precursor materials to release gas whose contrast effect is observed via B-scan.

4. U.S. Pat. 5,135,000 (Akselrod et al.) quantitates bloodflow via tracer transit time and volumetric measurements.

5. U.S. Pat. 5,233,993 (Kawano) shows in Fig. 1 an ultrasonic diagnostic apparatus with a digital scan converter 3 which performs a subtraction of line data obtained by successive transmissions and receptions. A subtraction image is formed in an image memory 5 and displayed on an image display 7. In Fig. 13 the subtraction image data is converted into color information and superposed on tomographic image data supplied from a tomographic image memory 5a.

6. U.S. Pats. 5,241,473 (Ishihara et al.) Fig.2, and 5,224,481 (Ishihara et al.) Fig. 1 each show an ultrasonic diagnostic apparatus in which differential image data is formed among tomographic images obtained in a time series. The differential image data is given color codes and a plurality of colored differential images are cumulatively displayed.

7. U.S. Pat. 5,255,683 (Monaghan) uses frequency-dependent characteristics of microbubble contrast agents detected in a specialized circuit adaptation to observe tissue perfusion. Fig. 6 shows the use of bandpass filters 42,44 for frequency analysis, either or both of which may be a variable bandpass filter (col. 8).

8. U.S. Pat 5,302,372 (Lin et al.) is directed in col. 5-6 to thresholded subtraction videodensitometry for measuring opacification of the left ventricle.

9. U.S. Pat. 5,456,257 (Johnson et al.) is described in the specification with reference to FIGURE 1 of the application.

10. U.S. Pat. 5,425,366 (Reinhardt et al.) describes a method for imaging the bursting of ultrasonic contrast agent microcapsules with color Doppler ultrasound.

11. The private communication "Nonlinear Acoustical Response of Coated Microbubbles in Diagnostic Ultrasound" by Volkmar Uhlenndorf and Christian Hoffmann of Schering AG (October 18, 1994) describes the transient nonlinear response of rupturing microbubbles.

Respectfully submitted,
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